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EXAMINER

BAKER, STEPHEN M

ART UNIT	PAPER NUMBER
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2133

DATE MAILED: 09/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/922,852

Applicant(s)

DIVSALAR ET AL.

Examiner

Stephen M. Baker

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-68 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-68 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to under 37 CFR 1.83(a) because they fail to show a parallel concatenated coding arrangement for the outer coder as described in the specification at page 10, lines 14-23 and required by claims 18, 32 and 45, or an inner code puncturing as described in the specification at page 16, lines 10-12 and required by claim 15. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
3. The drawings are objected to because in Fig. 3, "rate ≥ 1 " apparently should be "rate ≤ 1 ". A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
4. New corrected drawings are required in this application because of the reasons cited above. Applicant is advised to employ the services of a competent patent

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draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Specification

5. The disclosure is objected to because of the following informalities: on page 1, in line 3 of the background section, "limit of" apparently should be "limit on the" or "limit to the"; on page 2, line 10, "with rate" apparently should be "with a rate"; on page 3, in line 11, "use codes" apparently should be deleted; on page 5, in lines 10-13, the definition of a non-permuting device as an "interleaver" is in disagreement with conventional terminology, and should therefor be deleted; on page 6, in line 17, "an repeat" apparently should be "a repeat"; on page 6, in lines 15+, the Fig. 6 coder is incorrectly implied to be capable of providing "flexibility in the desired rate" over the coder in Fig. 5; on page 10, in lines 1-7, the Fig. 7 coder is incorrectly implied to be capable of providing "flexibility in the desired rate" over the coder in Fig. 5; on page 16, in lines 11-12, "greater than one, certain bits can be punctured to decrease the bit rate" apparently should be "less than one, certain bits can be punctured at specified intervals to increase the code rate" for consistency and to support the language of claim 15.

Claim Objections

6. Claims 3, 10, 12, 29, 33, 34, 40, 49-56 and 61 are objected to because of the following informalities:

In claim 3: "said first encoding is carried out by a first coder with a rate less than 1," is apparently unnecessary, as claim 1 specifies the first encoding as a repetition coding.

In claim 10: "x encoding operations" apparently should be "more than one additional encoding operations", in view of claim 9.

In claim 12: "repeat portion" apparently should be "repeated portion".

In claim 29: ", or substantially equal to," apparently should be deleted as unnecessary.

In claim 33: "converts" apparently should be "convert".

In claim 34: "are" apparently should be "is".

In claim 40: "with a rate less than one" is apparently unnecessary.

In claims 49-56: "A coder" apparently should be "A system".

In claim 61: "carried" apparently should be "carried out".

Appropriate correction is required.

7. Claims 17 and 23 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claims, or amend the claims to place the claims in proper dependent form, or rewrite the claims in independent form.

In claim 17: defining the first encoding as a "repetition code" apparently does not further limit claim 1.

In claim 23: as the phrase "uses a matrix" apparently refers to a mathematical model of the permuting function of any interleaver, and as an interleaver presumably possesses a bit permuting function, no further limit to claim 19 is apparent.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 2, 14, 18, 24, 25 and 34-68 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2: "said encoding" apparently should be "said second encoding", to provide an unambiguous antecedent basis.

In claim 14: "decoding" apparently should be "coding".

In claim 18: "said first encoding is via a concatenation of short block codes" is apparently not consistent with claim 1 wherein the "first encoding" is apparently a repetition code.

In claims 24 and 25: defining a device which performs no permutation as an "interleaver" is not consistent with accepted terminology in the coding art.

In claim 34: "said coding" lacks an unambiguous antecedent basis.

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In claim 36: referring to a coder having a rate that is "substantially equal to one" as a "rate one" coder is considered to be confusing.

In claims 38 and 53: "said middle coder is an interleaver and has a rate of one" apparently should be "said middle coder is coupled to a further interleaver and has a rate of one" because referring to an "interleaver" as a "coder" is considered to be confusing in the context provided.

In claim 46: "further comprising a plurality of said middle coders" apparently should be "wherein said second coder comprises a plurality of middle coders".

In claim 48: referring to a coder having a rate that is "substantially equal to one" as a "rate one" coder is considered to be confusing.

In claim 56: "said coder" lacks an unambiguous antecedent basis.

In claim 58: "method" apparently should be "system".

In claim 59: in line 6, "said data" lacks an unambiguous antecedent basis; referring to an "interleaver" as performing a "coding" step is considered to be confusing in the context provided; in lines 11-12, "linear structure which extends directly from input to output without recombinations or branches back" is vague in the context of claims 64 and 65 and in view of the disclosure which indicates that the coding system is not "recursive" between coders (p. 5, lines 19-20), but may include "recursive" encoders.

In claims 60 and 61: "said coding" lacks an unambiguous antecedent basis.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

11. Claims 1-5, 7-25, 27-32, 34-41, 43-50, 52-63, 65 and 66 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,044,116 to Wang (Wang).

Wang discloses an encoding arrangement including a “first encoding” (BIT REPETITION) that “repeats”, followed by a “second encoding” (SECOND ENCODER) that apparently has a rate =1 (Fig. 6), not considering tail bits or puncturing.

Regarding claim 2, Wang's second constituent encoder (SECOND ENCODER) is apparently a “linear transformation” as it is apparently a convolutional recursive encoder (col. 2, line 4).

Regarding claims 3 and 29, Wang's first constituent encoder (FIRST ENCODER) provides a "middle coder which carries out coding with a rate less than or equal to one", not considering puncturing.

Regarding claim 4, Wang's first constituent encoder (FIRST ENCODER) is a "q,n coder", also considering tail bits.

Regarding claim 5, as Wang's first constituent encoder (FIRST ENCODER) is apparently also a convolutional recursive encoder, it provides a form of "accumulator".

Regarding claims 7, 27, 43, 52, 63 and 65, as g^0 and g^1 are apparently the connection polynomials for Wang's convolutional recursive encoders (FIRST ENCODER, SECOND ENCODER), the polynomial representation "111" as a denominator term apparently corresponds to a transfer function $1/(1+D+D^2)$.

Regarding claim 8, considering the combination of Wang's first and second constituent encoders as the "second encoding", "two accumulators" are apparently provided.

Regarding claims 9 and 10, Wang's first constituent encoder (FIRST ENCODER) provides "at least one additional encoding operation" besides that of the second constituent encoder (SECOND ENCODER).

Regarding claims 11 and 12, Wang further shows an interleaver (SECOND ENCODER INTERLEAVER) between the repetition encoder (BIT REPETITION) and the second constituent encoder (SECOND ENCODER).

Regarding claim 13, Wang provides “a plurality of interleaving operations” (SYSTEMATIC INTERLEAVER, FIRST ENCODER INTERLEAVER, SECOND ENCODER INTERLEAVER).

Regarding claims 14 and 31, including Wang’s 1:3 splitting junction as a “coder”, Wang shows a total of four coders and three interleavers.

Regarding claim 15, Wang further shows a puncturer (PUNCTURE PATTERN) for “puncturing bits, at specified intervals, to chance the effective rate of the inner coder”.

Regarding claims 16, 34, 35, 60 and 61, Wang’s first and second constituent encoders (FIRST ENCODER, SECOND ENCODER) are “on separate branches of a tree structure”, as they are a parallel concatenation.

Regarding claims 18 and 45, Wang’s multiple repetition coding can be viewed as a concatenation of “short block codes” that are single repetition codings.

Regarding claim 28, considering the combination of Wang’s first and second constituent encoders as the “second encoding”, “an accumulator which accumulates twice” is apparently provided.

Regarding claims 30 and 32, Wang’s 1:3 splitting junction and second constituent code interleaver apparently constitute “a plurality of said middle coders” and the combination of a repetition encoder with a 1:3 splitting junction apparently constitutes “a concatenation of a plurality of short block coders”, as applicant apparently defines such.

Regarding claim 39, $k = n$ for Wang’s interleaver (SECOND ENCODER INTERLEAVER).

Regarding claims 41 and 49, as Wang's second constituent encoder (SECOND ENCODER) is apparently a convolutional recursive encoder, it provides a form of "accumulator".

Regarding claim 44, considering the combination of Wang's first and second constituent encoders as an "inner coding", "an accumulator which accumulates twice" is apparently provided, and as the rate of both encoders combined is $\frac{1}{2}$, the combination is "substantially rate one" as applicant defines such (p. 5, line 17).

Regarding claim 50, as Wang's second constituent encoder (SECOND ENCODER) is apparently a convolutional recursive encoder, it provides a form of "digital filter with a specified transfer function".

Regarding claim 54, Wang's 1:3 splitting junction and second constituent code interleaver provide "at least one additional coder and at least one interleaver, said additional coder having a rate less than one and coding according to an (n,k) code", where $n=3$ and $k=1$.

Regarding claims 56-58, Wang's constituent coders (FIRST ENCODER, SECOND ENCODER) are linear "accumulators" on separate "branches" and there is no "recurring back or recombining" between "branches" *per se*.

Regarding claim 66, Wang's turbo decoder use "*a posterior(i)*" decoding techniques (Fig. 7).

12. Claims 19, 20, 23, 24, 26, 29, 36-39, 41, 42, 46, 48-51, 53, 58-60, 62 and 64 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,032,284 to Bliss (hereafter Bliss).

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Bliss discloses encoding for a magnetic disk channel. Bliss shows (Fig. 3) an inner coder (B10) with a transfer function " $1/(1+D)$ ". A middle coder comprises a trellis encoder (B6) with rate = 8/9 in one example (col. 14, line 3). An outer code (not shown) can comprise Reed-Solomon code that is block-interleaved to a depth of three (col. 22, lines 13-15). The rate of the Reed-Solomon code is presumably greater than 9/10.

13. Claims 19, 23-25, 29-33, 48, 53 and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,392,299 to Rhines *et al* (hereafter Rhines).

Rhines discloses encoding for a media channel. Rhines shows (Fig. 3) an inner coder (160) in the form of a Miller-squared media channel coder with a rate approximately equal to one, as applicant defines such. An outer coder (12) is a Reed-Solomon encoder with a rate approximately equal to one, followed by an interleaver (16). Middle coding is provided by two reed-Solomon encoders (90, 150) with another interleaver (110) interposed between.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of the publication to Wiberg *et al*, "Codes and Iterative Decoding on General Graphs".

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Wang does not discuss the operation of the turbo decoder specifically in terms easily identifiable as a "Tanner graph representation". Wiberg teaches turbo decoder operation in accordance with a Tanner graph representation, which was conventional in the turbo code art at the time the invention was made. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to implement Wang's turbo decoder "by using a Tanner graph representation". Such an implementation would have been obvious because turbo decoder operation in accordance with a Tanner graph representation was already conventional in the turbo code art and taught by Wiberg.

Allowable Subject Matter

16. Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (703) 305-9681. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3800.



Stephen M. Baker
Primary Examiner
Art Unit 2133

smb